Practitioner's Docket No. 915-003.3

CHAPTER II

Preliminary Classification.
Proposed Class:
Subclass:
NOTE: *"All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129' " M.P.E.P., § 601, 7th ed.*

TRANSMITTAL LETTER TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

PCT/EP00/08145	17 August 2000	18 August 1999
INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED

Connection Control in a Communication System
TITLE OF INVENTION

Oscar SALONAHO
APPLICANT(S)

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U.S. PATENT AND TRADEMARK OFFICE
P.O. BOX 2327
ARLINGTON, VA 22202
ATTN: EO/US

CERTIFICATION UNDER 37 C.F.R. § 1.10*
*(Express Mail label number is **mandatory**.)*
(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date 2/8/02, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EV005523809US, addressed to the: Assistant Commissioner for Patents,

Judith Schick
(type or print name of person mailing paper)

Judith Schick
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: *Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.*

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

a. [X] This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).

b. [X] The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
☐*	TOTAL CLAIMS 17	0 -20=		× $18.00=	$
	INDEPENDENT CLAIMS 3	0 -3=		× $84.00	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $260.00	
BASIC FEE**	☐ U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: ☐ and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) ..... $100 ☐ and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) $710				
	☒ U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: ☐ has been paid (37 C.F.R. § 1.492(a)(2)) ..... $740 ☐ has not been paid (37 C.F.R. § 1.492(a)(3)) ..... $1040 ☒ where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) $890				$ 890.00
				Total of above Calculations	= 890.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.9, 1.27, 1.28)				–
				Subtotal	890.00
				Total National Fee	$890.00
	Fee for recording the enclosed assignment document $40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL				Total Fees enclosed	$ 890.00

*See attached Preliminary Amendment Reducing the Number of Claims.

i. ☒ A check in the amount of $890.00 to cover the above fees is enclosed.

ii. ☐ Please charge Account No. _____ in the amount of $ _____. A duplicate copy of this sheet is enclosed.

**WARNING: *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).*

WARNING: *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: *Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.*

a. ☐ is transmitted herewith.

b. ☐ is not required, as the application was filed with the United States Receiving Office.

c. ☒ has been transmitted

i. ☒ by the International Bureau.
Date of mailing of the application (from form PCT/1B/308): 22 Feb. 2001

ii. ☐ by applicant on _____.
Date

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

a. ☐ is transmitted herewith.

b. ☒ is not required as the application was filed in English.

c. ☐ was previously transmitted by applicant on _____.
Date

d. ☐ will follow.

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

a. ☐ are transmitted herewith.

b. ☐ have been transmitted

i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308): _____.

ii. ☐ by applicant on (date) _____.
Date

c. ☒ have not been transmitted as

i. ☒ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.): 12 December 2000

ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

a. ☐ is transmitted herewith.

b. ☐ is not required as the amendments were made in the English language.

c. ☒ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)

☒ is transmitted herewith.

☐ is not required as the application was filed with the United States Receiving Office.

8. ☒ Annex(es) to the international preliminary examination report

a. ☒ is/are transmitted herewith.

b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☒ A translation of the annexes to the international preliminary examination report

a. ☐ is transmitted herewith.

b. ☒ is not required as the annexes are in the English language.

10. [X] An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

    a. [ ] was previously submitted by applicant on _____ Date

    b [ ] is submitted herewith, and such oath or declaration

        i. [ ] is attached to the application.

        ii. [ ] identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.

        iii. [X] will follow.

II. Other document(s) or information included:

11. [X] An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

    a. [ ] is transmitted herewith.

    b. [X] has been transmitted by the International Bureau.
    Date of mailing (from form PCT/IB/308): 22 February 2001

    c. [ ] is not required, as the application was searched by the United States International Searching Authority.

    d. [ ] will be transmitted promptly upon request.

    e. [ ] has been submitted by applicant on _____. Date

12. [X] An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

    a. [X] is transmitted herewith.

    Also transmitted herewith is/are:

    [X] Form PTO-1449 (PTO/SB/08A and 08B).

    [X] Copies of citations listed.

    b. [ ] will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

    c. [ ] was previously submitted by applicant on _____. Date

13. [ ] An assignment document is transmitted herewith for recording.

    A separate [ ] "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or [ ] FORM PTO 1595 is also attached.

_____

_____

_____

10/049249

JC10 Rec'd PCT/PTO 08 FEB 2002

14. [X] Additional documents:
    a. [X] Copy of request (PCT/RO/101)
    b. [X] International Publication No. WO 01/13536
        i. [ ] Specification, claims and drawing
        ii. [ ] Front page only
    c. [X] Preliminary amendment (37 C.F.R. § 1.121)
    d. [ ] Other

15. [X] The above checked items are being transmitted
    a. [X] before 30 months from any claimed priority date.
    b. [ ] after 30 months.

16. [ ] Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: *Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.*

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

[X] The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 23-0442.

[X] 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

☐ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☐ 37 C.F.R. § 1.17 (application processing fees)

☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

SIGNATURE OF PRACTITIONER

Reg. No.: 27,550

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Alfred A. Fressola
(type or print name of practitioner)
WARE, FRESSOLA, VAN DER SLUYS & ADOLPHSON LLP
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PATENT
915-003.3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the matter of: Salonaho	)	
	)	
Serial No:	)	Group Art Unit
	)	Examiner:
Filed: Herewith	)	
	)	
International Application: PCT/EP00/08145	)	
	)	
International Filing Date: 17 August 2000	)	
	)	
For: Connection Control in a Communication System	)	

ASSISTANT COMMISSIONER OF PATENTS
WASHINGTON, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Please preliminarily amend the above-referenced application as follows:

In the Claims:

Please amend claims 3 - 9, 11, and 14 - 17 as follows. Claims 18 and 19 have been cancelled without prejudice.

Express Mail No. EV005523809US

3. (Amended) A method in accordance with claim 1, further comprising;

transmitting power control commands between the transmitting station and the receiving station, said power control commands including either the power up or the power down request in accordance with the determined requirement, wherein the step of monitoring the distribution of the power up and the power down requirements comprises monitoring the requests derived from the power control commands.

4. (Amended) A method in accordance with claim 1, wherein the form of the distribution of the power up and the power down requirements is defined on basis of variations in a Signal Interference Ratio (SIR) target.

5. (Amended) A method in accordance with claim 1, wherein the transmitting station is a base station of a mobile communication system and the receiving station is a mobile station.

6. (Amended) A method in accordance with claim 1, wherein said determining of the power up requirement or power down requirement and said monitoring of the distribution are accomplished at the receiving station.

7. (Amended) A method in accordance with claim 1, wherein said determining of the power up requirement or power down requirement is accomplished at the receiving station and said monitoring of the distribution is accomplished at the transmitting station.

8. (Amended) A method in accordance with claim 1, wherein the step of changing the transmission parameter of the connection comprises returning the transmission parameter of the connection to a predefined value.

9. (Amended) A method in accordance with claim 1, wherein at least some of control parameters used for controlling the transmission parameter of the connection are transmitted to the receiving and/or transmitting station using radio network apparatus.

11. (Amended) A method in accordance with claim 1, comprising simultaneous use of at least two different sets of control parameters used for controlling the connection.

14. (Amended) An arrangement in accordance with claim 12, wherein the means for changing the transmission parameter of the connection are arranged to return the transmission parameter to a predefined value.

15. (Amended) An arrangement in accordance with claim 12, wherein the receiving station comprises the control unit, the means for monitoring distribution of the power up and the power down requirements and the means for changing the transmission parameter.

16. (Amended) An arrangement in accordance with claim 12, wherein the transmitting station is a base station and the receiving station is a mobile station.

17. (Amended) A receiving station for use in a communication system, comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means for monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for a change in quality target to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

In the Abstract:

Please add the following Abstract of the Disclosure and place after the claims:

--Abstract of the Disclosure

The present invention relates to a method of controlling at least one transmission parameter of a connection between a transmitting station (BS) and receiving station (MS0. The method comprises the steps of receiving at the receiving station a transmission signal from the transmitting station, determining from the received transmission signal whether there exists a power up requirement or a power down requirement, and monitoring the distribution of the power up and power down requirements over a period. If a predefined form of the distribution is detected, the quality target of the connection is changed. The present invention relates also to an arrangement and a receiving station for implementing the method.--.

915-003.3

Remarks

This preliminary amendment is filed for the purpose of placing the application into standard U.S. format. Claims 3 - 9, 11 and 14 - 17 have been amended and claims 18 and 19 have been cancelled without prejudice. Consideration and allowance of the claims is earnestly solicited.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Respectfully submitted,

Date: 8 Feb 02

Alfred A. Fressola, Reg. No. 27,550
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AAF/aks

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 3 - 9, 11 and 14 - 17 have been amended.

3. (Amended) A method in accordance with [any of the preceding claims] claim 1, further comprising;

transmitting power control commands between the transmitting station and the receiving station, said power control commands including either the power up or the power down request in accordance with the determined requirement, wherein the step of monitoring the distribution of the power up and the power down requirements comprises monitoring the requests derived from the power control commands.

4. (Amended) A method in accordance with claim 1 [or 2], wherein the form of the distribution of the power up and the power down requirements is defined on basis of variations in a Signal Interference Ratio (SIR) target.

5. (Amended) A method in accordance with [any of the preceding claims] claim 1, wherein the transmitting station is a base station of a mobile communication system and the receiving station is a mobile station.

6. (Amended) A method in accordance with [any of the preceding claims] claim 1, wherein said determining of the power up requirement or power down requirement and said monitoring of the distribution are accomplished at the receiving station.

7. (Amended) A method in accordance with [any of claims 1 to 5] claim 1, wherein said determining of the power up requirement or power down requirement is accomplished at the receiving station and said monitoring of the distribution is accomplished at the transmitting station.

8. (Amended) A method in accordance with [any of the preceding claims] claim 1, wherein the step of changing the transmission parameter of the connection comprises returning the transmission parameter of the connection to a predefined value.

9. (Amended) A method in accordance with [any of the preceding claims] claim 1, wherein at least some of control parameters used for controlling the transmission parameter of the connection are transmitted to the receiving and/or transmitting station using radio network apparatus.

11. (Amended) A method in accordance with [any of the preceding claims] claim 1, comprising simultaneous use of at least two different sets of control parameters used for controlling the connection.

14. (Amended) An arrangement in accordance with [any of] claim 12 [or 13], wherein the means for changing the transmission parameter of the connection are arranged to return the transmission parameter to a predefined value.

15. (Amended) An arrangement in accordance with [any of claims 12 to 14] claim 12, wherein the receiving station comprises the control unit, the means for monitoring distribution of the power up and the power down requirements and the means for changing the transmission parameter.

16. (Amended) An arrangement in accordance with [any of claims 12 to 15] claim 12, wherein the transmitting station is a base station and the receiving station is a mobile station.

17. (Amended) A receiving station for use in a communication system, comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means [from] for monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for [transmission parameter change] a change in quality target to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

CONNECTION CONTROL IN A COMMUNICATION SYSTEM

FIELD OF THE INVENTION

The present invention relates to a method of controlling at least one transmission parameter of a connection between a transmitting station and a receiving station in a communication system. The invention relates further to an arrangement in a communication system and to a receiving station for use in a communication system.

BACKGROUND OF THE INVENTION

In a mobile telecommunication system, such as a CDMA (Code Division Multiple Access) or WCDMA (Wide-band CDMA) or TDMA (Time division Multiple Access) system, transmission power levels between a base station (BS) and a mobile station (MS) associated with said BS can be continuously adjusted during an ongoing connection between the BS and the MS. This is done in order to provide a sufficient quality for the transmission in various conditions. To reduce power consumption and interference it is also preferred to keep the required transmission power levels as low as possible at the same time. By means of this it is possible to avoid "wasting" any network resources and MS battery resources, and to enable as great a number of mobile stations as possible to communicate simultaneously with the same BS having only limited power resources.

One system of power control is based on Power Control (PC) commands transmitted from one station to another to cause the other station to alter its power. The commands can be transmitted e.g. in a WCDMA closed loop. The closed loop power

control mechanism between the BS and MS is used for equalising the power of signals from the MS at the BS input and also for compensating fast power deviations from the nominal level. These closed loop PC (CL PC) commands can be sent both in the uplink (towards the base station) and in the downlink (towards the mobile station), whereafter the BS or the MS will process the received command and reduce/increase its transmission power towards the receiving station (i.e. MS or BS respectively) accordingly.

For example, in the currently proposed WCDMA system it is envisaged that an outer loop PC generated by a radio network controller (RNC) of the WCDMA system will attempt to set the connection quality target (that the closed loop follows) of a physical connection between the BS and MS to be such that the required FER (Frame Error Ratio) target of the connection is met with a minimal connection quality target. The connection quality target can be announced e.g. by means of a so called Eb/No (Signalling Energy/Noise) target or SIR (signal to Interference Ratio) target or a similar parameter indicating some quality measurement for the connection. The relationship is such that the connection quality target (e.g. the SIR target) has to be set such that the FER remains at an appropriate level. The actual connection quality value (e.g. SIR) is then adjusted in accordance with the target value, and should follow any changes in the target value. The idea behind this is that by increasing the connection quality target value the connection quality will increase and the FER will improve.

However, if the FER target cannot be met due to e.g. a limitation in the available transmission power when severe interference or attenuation is predicted, the connection quality target will start increasing even though this rise in

the connection quality target will not help in causing a better connection between the MS and the BS. If the power limitation is caused by a temporary lack of power caused by a condition such as slow fading or a temporarily weak connection (if, for instance, the MS is situated temporarily in a tunnel or cellar), the quality target will be unnecessarily high once this condition has been removed. This will result in an excessively high transmitted power until the quality target has returned to its normal (appropriate) level. At the BS side this unnecessarily used power resource could be used for transmission towards other mobile stations. At the MS side this will lead among other things, to unnecessary high power consumption and to a possible disturbance to other radio and/or electronic devices.

To give a more precise example, if the BS runs out of power (i.e. a power limitation situation occurs), then the mobile station MS will experience a higher FER than the set FER target. This will result (if not limited by some means) in an unlimited rise of the SIR target value. In accordance with one exemplifying possibility the average rate per frame of this rise can be given by the formula

$$rise\_per\_frame = (FER - FER_{th})\, step\_size$$

where

FER is the actual obtained FER,

FER_{th} is the FER target and

step_size is the step size of the outer loop algorithm

Thus, if the actual FER is 2%, the FER target is 1% and the step size is 0.5dB the SIR target will in ten seconds (1000 frames) be raised by 1%*1000*0.5 dB = 5dB, which can be

considered to be a substantial rise. If the higher FER has been caused by e.g. shadowing and the situation changes suddenly the SIR target will be much too high for a while after this condition ends. In this specific example, the SIR target would decrease gradually back to its appropriate value in approximately 5/0.0005 = 1000 frames = 10 seconds.

Earlier proposals to solve this problem have been based on setting absolute limits on the values of the quality targets. There are, however, some problems associated with this type of solution. Firstly, the set absolute limits have to be relatively loose due to the variations in the required quality target for satisfactory quality of the communication. Secondly, the setting of absolute limits for the MS is problematic due to the fact that the absolute value of the quality value setpoint depends heavily on the used estimation method.

SUMMARY OF THE INVENTION

The embodiments of the present invention aim to at least partially overcome one or several of the disadvantages of the prior art proposals in avoiding an undesired and/or unlimited increase of the connection quality target for a connection between a transmitting and a receiving station in a mobile communication system. A further preferred aim of the embodiments is to provide a solution by means of which it is possible to rapidly lower the transmission power level to an appropriate value after a rapid improvement in the air interface between the transmitting and receiving station.

According to a first aspect, the invention provides a method of controlling at least one transmission parameter of a connection

between a transmitting station and receiving station in a communication system comprising:

receiving at the receiving station a transmission signal from the transmitting station;

determining from the received transmission signal whether there exists a power up requirement or a power down requirement;

monitoring the distribution of the power up and power down requirements over a period; and

in the event that a predefined form of the distribution is detected, changing quality target for the received signal.

According to a second aspect the invention provides an arrangement for controlling at least one transmission parameter of a connection between a transmitting station and a receiving station in a communication system comprising:

a control unit for determining a power up requirement or a power down requirement;

means for monitoring the distribution of the power up and power down requirement over a period; and

means for changing the quality target of the transmission in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

According to a further aspect, the invention provides a receiving station for use in a communication system, comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means from monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for

transmission parameter change to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

In a more specific embodiment a transmission power level parameter is also changed. A still more specific embodiment comprises transmitting power control commands between the transmitting station and the receiving station, said power control commands including either the power up or the power down request in accordance with the determined requirement, wherein the step of monitoring the distribution of the power up and the power down requirements comprises monitoring the requests derived from the power control commands. According to one alternative the form of the distribution of the power up and the power down requirements is defined on basis of variations in the Signal Interference Ratio (SIR) target. The transmitting station can be a base station and the receiving station a mobile station, or then vice versa. Said determining of the power up requirement or power down requirement and said monitoring of the distribution can be accomplished at the receiving station, or then said determining of the power up requirement or power down requirement is accomplished at the receiving station and said monitoring of the distribution is accomplished at the transmitting station. The step of changing the transmission parameter may comprise returning the transmission parameter to a predefined or default value. At least some of parameters controlling the transmission parameter of the connection can be transmitted to the receiving and/or transmitting station using mobile networks apparatus. In addition, it is possible to use at least two different sets of control parameters simultaneously when controlling the connection.

Several advantages are obtainable by means of the embodiments of the present invention, as they provide a new type of solution for controlling the connection between transmitting and receiving stations, and for instance, for controlling the connection quality target and/or power levels used for the transmission. By means of the proposed embodiments it is possible to prevent unnecessary high power levels after a temporality weak connection has returned to its normal quality. It is also possible to prevent unnecessary rise in the power level the receiving station asks from the transmitting station in case where it is not possible for the transmitting station to provide any more power.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention and other objects and advantages thereof will now be explained in an exemplifying manner with reference to the annexed drawings, in which:

Figure 1 shows a part of a mobile communication system;

Figure 2 shows a transmitter-receiver pair;

Figure 3 shows a flow chart in accordance with one embodiment; and

Figures 4 to 6 illustrate results of simulations accomplished for the proposed method.

DETAILED DESCRIPTIONS OF THE DRAWINGS

Figure 1 is a schematic presentation of a part of a mobile communication system, disclosing a base station BS and some mobile stations MS communicating with the BS. The MS could be moveable (e.g. a hand portable mobile phone or a hand portable computer provided with a radio transceiver facility or a communicator) or could be fixed in location (e.g. if the MS is

to serve an office at a fixed side). The skilled person is familiar with the operational principles and the various components of a mobile communication system, such as a CDMA system, WCDMA system, FDMA system or a TDMA system providing mobility for the mobile station users thereof, and thus these will not be described in detail. The other parts of a functioning mobile network apparatus have also been omitted from Figure 1 for the reasons of clarity.

The BS transmits to each of the mobile stations MS with a power level that is adjusted in accordance with, for example, a Power Control (PC) command or similar message received from each of the respective mobile stations MS, that is, the transmission power levels can be different at a given moment between the base station BS and each of the respective mobile stations MS. Correspondingly, each MS transmits towards the BS with a power level adjusted in accordance with particular PC commands transmitted by the BS to that precise MS. For example, in the proposed WCDMA system the PC commands would be transmitted in a WCDMA closed loop. In order to be able to accomplish this functionality, both the BS and the MS are equipped with appropriate control and processing units.

Figure 2 shows in more detail one base station and mobile station pair. The mobile station comprises an antenna 6 via which it is arranged to transmit and receive signalling from the base station. The base station comprises correspondingly an antenna 16 via which it is arranged to transmit and receive signalling from the mobile station. The mobile station is capable of transmitting a message (e.g. a closed loop power command) indicating that the quality of the signalling received from the base station is too low or then that the quality is too high. At the base station the message can be received by

a transceiver unit 14 from which the message is passed to a power up/down controller 13 controlling the actual transmission power level of the transceiver unit 14. The transceiver unit 14 of the base station may increase the transmission power in order to improve the quality of the signal received at the mobile station end or lessen the transmission power in order to avoid any use of unnecessarily high transmission powers in accordance with instructions received from the unit 13.

The base station includes further a control unit 11. Control unit 11 is arranged to control the received power control commands or similar messages and to monitor the distribution of the power up and power down requests, as will be explained later. It is noted that even though this example shows the controller and the monitoring facility as a single unit 11, they could also be in the form of separated units. It is also to be appreciated that the single unit could also comprise the power up/power down control and/or any other possible control functionalities a transmitting station controller may have. It is noted that the MS may comprise similar functionalities and that monitoring can also be done at the mobile station of Figure 2, by means of appropriate monitoring and control apparatus 1 to 4 implemented in the MS.

The PC command from the MS and received at the BS may indicate that the transmission power level toward the MS (the receiving station in this example) should go up (power up) or that the transmission power level should go down (power down). In normal operation conditions the average distribution between the determined power up and power down situations should be about 50/50 within a certain predefined period, such a 100 frames or 100 seconds. If the form of the distribution within the period deviates from this, e.g. such that there are 80

requests for "up" and only 20 "down", this 80/20 distribution indicates that for some reason the connection does not meet the quality requirements and that the receiving station (for instance, the control unit, such as a CPU 1, of the mobile station of Figure 2) keeps on requesting more transmission power so as to improve the quality of the received signal. In an opposite occasion, i.e. when there are 80 requests for "down" and only 20 for "up", this form of distribution will indicate that the connection is far better than required, and the transmission power could thus be reduced more rapidly to the normal level, i.e. to a predefined transmission power default level.

The need for sending a power up or a power down request is determined on the basis of monitoring the quality of the received transmission signal at the receiving station (i.e. either at the BS or the MS). This determination can, for example, be based on monitoring whether the FER (Frame Error Ratio) meets the FER target or not. If not, the SIR (Signal to Interference Ratio) target is raised, and subsequently a power up request is formed and transmitted to the transmitting station in order to improve the quality of the received transmission by increasing the transmission power of the connection. However, if the transmitting station cannot respond to this request, the result is that the receiving station will still suffer from a bad quality connection, and in order to correct the situation it will increment the power requirement e.g. by 0.5dB. As already explained, this will only lead to an unwanted rise in the target value, and the correction of this "unnatural" situation may take some time.

As disclosed by the flow chart of Figure 3, in the proposed solution the quality target (such as the Eb/No target or SIR

target) is prevented from rising should a power limitation situation occur by returning a predefined transmission parameter of the connection, such as the power level or quality target to a predefined or default value in case monitoring of distribution of the defined power up and power down needs shows that the form of the distribution deviates a predefined amount from average. According to one alternative this can be accompanied by monitoring the transmitted closed loop PC commands by the monitoring unit 11 (or unit 2 of the mobile station) in order to detect the power up or power down requests from these commands. The monitoring may also occur already at the stage of determining a need for a change in the power level at the receiving station. In any case, the logic here is that if the transmission power is limited at the transmitting station or if the transmitting power is far too high, then the distribution for the transmitted up/down commands will become deviated significantly from an average 50/50 situation in either direction (up/down) at the receiving station, as it keeps on asking more (connection weakened) or less (connection improved) power over a certain predefined period or window.

One algorithm which can be used here is in pseudocode as follows.

```
SIR_old=SIR_target (n)

Calculate the average amount of transmitted "up" commands
during a period of k frames. Then
IF average > threshold1
        SIR_target (n+k)=SIR old;
ELSE IF average < threshold2
        SIR_target(n+k)=SIR_old;
END
```

The threshold values can be set in accordance with predefined control parameters to achieve satisfactory performance. According to one possibility, the control parameters used in the algorithms can be sent to each BS of the system over an Iub interface and/or over the air interface from the BS to the MS. The control parameters can also be centrally updated e.g. by the network operator, e.g. in the case that more/less transmission power resources become available, either temporarily or permanently. Instead of having the control unit within the receiving station, the control unit for this can also be situated in another network or there could be separate control units interfacing the network including the receiving and the transmitting stations.

As can be seen from the above algorithm, when the control unit of the receiving station determines that the form of the distribution deviates more than is allowed from the average distribution, it will immediately return the SIR_target to the predefined SIR_old value, whereafter the operation will continue from this default value, and thereby excessively high target values are avoided in case of limited transmission power and the power level is returned rapidly into a minimal appropriate level should the connection conditions suddenly improve. Even though the quality of the connection does not become better as such by means of this proposal, it does help in removing problems relating to an excessive increase of the target value.

According to one embodiment, if the above algorithm determines the SIR target increase at the BS, this action shall be reported to the radio network controller designated by 12 in Figure 2 which may then proceed accordingly, e.g. reserve more

power resources for that precise transmission or send an appropriate message to the network operator indicating that there are some problems in the power levels or other transmission parameters.

It should be noted, that this type of algorithm can also be used in a concatenated form, i.e. two or more different sets of control parameters can run in parallel. In practice this can be implemented e.g. such that there are two monitoring periods, a shorter one and a longer one, wherein the arrangement is such that in the shorter monitoring period the control parameters are set such that a greater deviation in the distribution is allowed, while the longer period averaging a greater amount of frames allows a smaller amount of deviation in the distribution. By means of using several sets of control parameters it is possible to improve further the system's sensitivity for different types of variations and/or disturbances in the connection.

At present the proposed solution as such is believed to be preferably applicable at the MS end, considering current implementation of network functionalities. However, the solution can be equally implemented at the BS side as well or instead without departing from the scope of the idea. In addition, even though the preferred implementation at the moment is such that the determining of the need for power up or power down requirements and the monitoring of the distribution thereof are both accomplished at the receiving station, this can also be implemented such that only said determining step of the need for power up or power down is accomplished at the receiving station and said monitoring of the distribution is then accomplished at the transmitting station subsequent to having received the power up/power down commands or similar

indication of the changed power requirements. In the latter alternative the transmitting station can then, for example, purely ignore the power up requests without any further processing after having detected a deviation in the distribution exceeding a threshold value, or immediately drop the transmitting power in case a power down biased distribution is recognised.

In addition to the deviation of the average, the monitored form of the distribution can also be, for instance, a certain pattern of the power up and power down requirements indicating some special air interface condition. After having detected a predefined form of subsequent power up and power down requirements, the system may change the predefined transmission parameter, such that the quality target or the power level in accordance with predefined parameter values, such as return the quality target or power level to a default (lower) value or to increase the target or power level by more than one "normal" step at once or then "freeze" the parameter to a certain value for some time. This type of distribution form detection can also form part of the concatenated solution whereby the transmission parameter adjustment will be based simultaneously both on the distribution deviation detection and on the distribution pattern detection.

If the adjustment system is biased e.g. such that it will automatically lower the power level or the quality target if no power up requests are received, the form of distribution used in the proposed solution can then be derived from the proportion between the received power up requests and the power down status.

Figures 4 to 6 show simulation results for the SIR target as

function of time obtained for the above algorithm when simulated with a COSSAP simulator by Synopsys Inc. for three different FER values, which were FER=0.013 (with unlimited PC dynamics), FER=0.0255 (with limited PC dynamics), and FER=0.0715 (with limited PC dynamics), respectively. (The unlimited case assumes that there will be no power limitations whatsoever, whereas in the limited case there is a transmission power limit). In the diagrams the horizontal axis defines the number of frames and the vertical axis defines the SIR target in dB.

In the simulation the PC commands were averaged on 20 frames periods (320 PC commands), and the threshold1 was set to equal 0.6. These parameters leave 0.2x320=64 PC command margin for the UP commands, i.e. the power can rise 64 dB during the average period without the algorithm giving a false alarm (in case the PC commands are otherwise error free). The channel was a 2-tap channel with antenna diversity (uncorrelated antennas) and the used channel speed was 3 km/h.

As can be seen from Figures 4 to 6, the algorithm is capable of efficiently cutting the increase in the SIR target value and rapidly returning the power level into a predefined initial value. This can be concluded from the fact that the SIR target will not become raised permanently even in Figure 6 instance where the FER value is substantially high.

Thus the invention provides a clear advantage over the prior art proposals, as it enables more rapid and dynamic response to the changed transmission conditions and makes it possible to avoid unwanted increases in the connection quality target values in cases where it is not possible to receive any more transmission power.

It is noted herein that while the above describes some embodiments of the present invention there are several variations and modifications which may be made to the disclosed solution without departing from the spirit and scope of the present invention as defined in the appended claims.

Claims

1. A method of controlling at least one transmission parameter of a connection between a transmitting station and receiving station in a communication system comprising:

receiving at the receiving station a transmission signal from the transmitting station;

determining from the received transmission signal whether there exists a power up requirement or a power down requirement;

monitoring the distribution of the power up and power down requirements over a period; and

in the event that a predefined form of the distribution is detected, changing quality target for the received signal.

2. A method in accordance with claim 1, comprising changing the power level of the transmission.

3. A method in accordance with any of the preceding claims, further comprising:

transmitting power control commands between the transmitting station and the receiving station, said power control commands including either the power up or the power down request in accordance with the determined requirement, wherein the step of monitoring the distribution of the power up and the power down requirements comprises monitoring the requests derived from the power control commands.

4. A method in accordance with claim 1 or 2, wherein the form of the distribution of the power up and the power down requirements is defined on basis of variations in a Signal Interference Ratio (SIR) target.

5. A method in accordance with any of the preceding claims, wherein the transmitting station is a base station of a mobile communication system and the receiving station is a mobile station.

6. A method in accordance with any of the preceding claims, wherein said determining of the power up requirement or power down requirement and said monitoring of the distribution are accomplished at the receiving station.

7. A method in accordance with any of claims 1 to 5, wherein said determining of the power up requirement or power down requirement is accomplished at the receiving station and said monitoring of the distribution is accomplished at the transmitting station.

8. A method in accordance with any of the preceding claims, wherein the step of changing the transmission parameter of the connection comprises returning the transmission parameter of the connection to a predefined value.

9. A method in accordance with any of the preceding claims, wherein at least some of control parameters used for controlling the transmission parameter of the connection are transmitted to the receiving and/or transmitting station using radio network apparatus.

10. A method in accordance with claim 9, wherein the control parameters are defined in and/or control parameter updates are transmitted from a separate control unit.

11. A method in accordance with any of the preceding claims, comprising simultaneous use of at least two different sets of

control parameters used for controlling the connection.

12. An arrangement for controlling at least one transmission parameter of a connection between a transmitting station and a receiving station in a communication system comprising:

a control unit for determining a power up requirement or a power down requirement from a signal transmitted from the transmitting station;

means for monitoring the distribution of the power up and power down requirements over a period; and

means for changing the quality target of the transmission in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

13. An arrangement in accordance with claim 12, comprising means for changing the power level of the transmission.

14. An arrangement in accordance with any of claim 12 or 13, wherein the means for changing the transmission parameter of the connection are arranged to return the transmission parameter to a predefined value.

15. An arrangement in accordance with any of claims 12 to 14, wherein the receiving station comprises the control unit, the means for monitoring distribution of the power up and the power down requirements and the means for changing the transmission parameter.

16. An arrangement in accordance with any of claims 12 to 15, wherein the transmitting station is a base station and the receiving station is a mobile station.

17. A receiving station for use in a communication system,

comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means from monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for transmission parameter change to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

18. A receiving station in accordance with claim 17, wherein the transmission parameter comprises quality target of the received transmission.

19. A receiving station in accordance with claim 17, wherein the transmission parameter comprises power level of the transmission.

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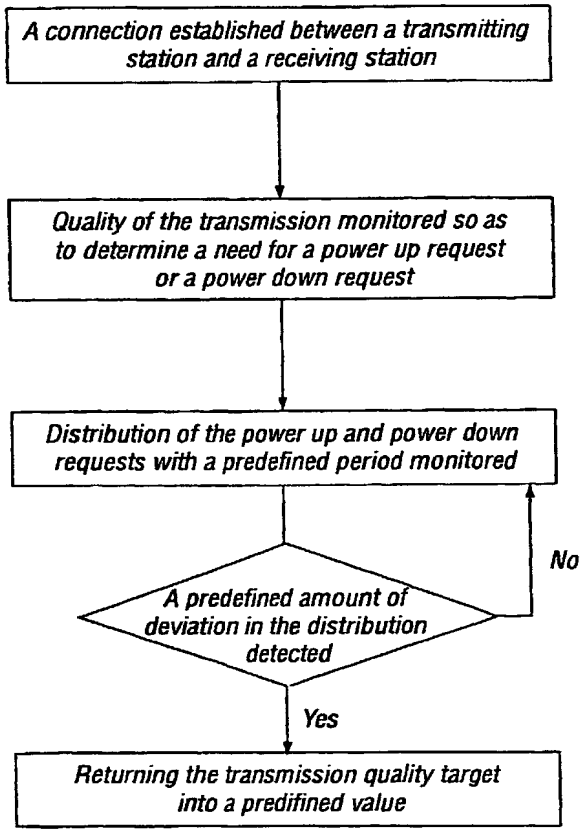
[Continued on next page]

(54) Title: CONNECTION CONTROL IN A COMMUNICATION SYSTEM



(57) Abstract: The present invention relates to a method of controlling at least one transmission parameter of a connection between a transmitting station (BS) and receiving station (MS). The method comprises the steps of receiving at the receiving station a transmission signal from the transmitting station, determining from the received transmission signal whether there exists a power up requirement or a power down requirement, and monitoring the distribution of the power up and power down requirements over a period. If a predefined form of the distribution is detected, the quality target of the connection is changed. The present invention relates also to an arrangement and a reeiving station for implementing the method.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

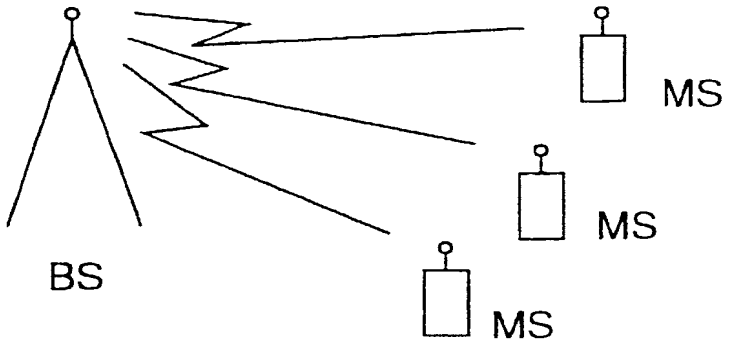
MS
MS
MS
BS

FIG. 1

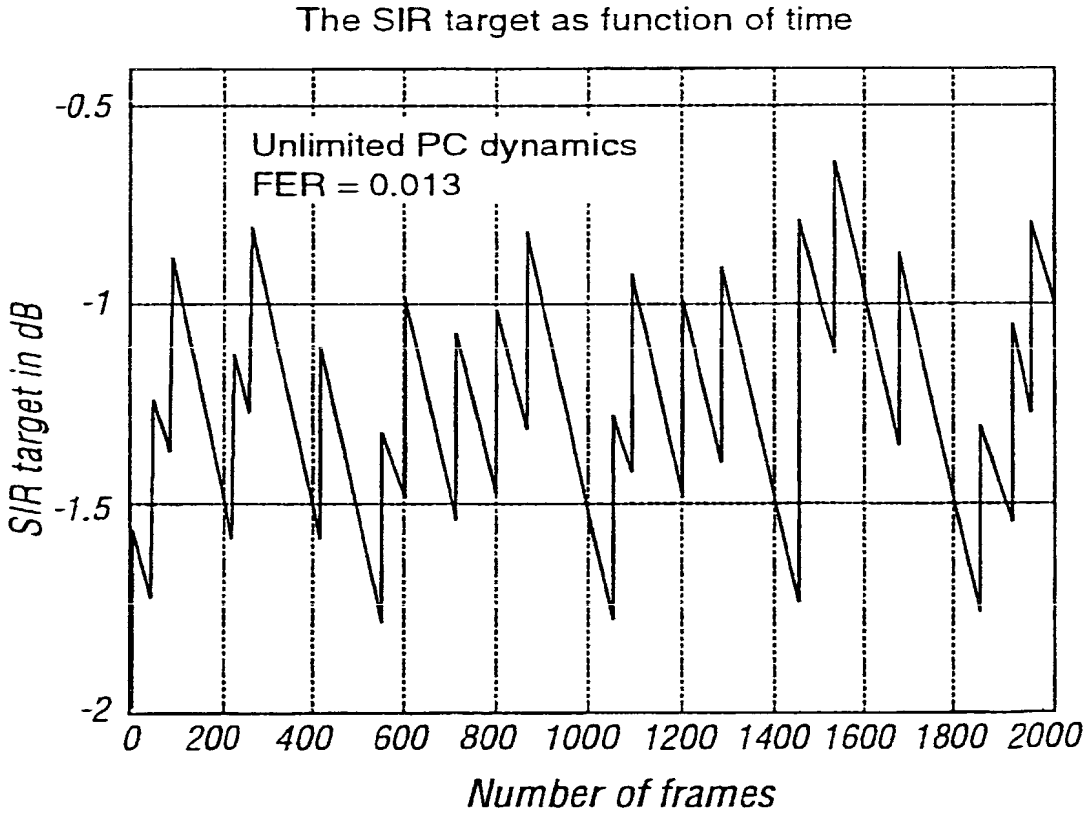
The SIR target as function of time
Unlimited PC dynamics
FER = 0.013
SIR target in dB
-0.5
-1
-1.5
-2
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Number of frames

FIG. 4

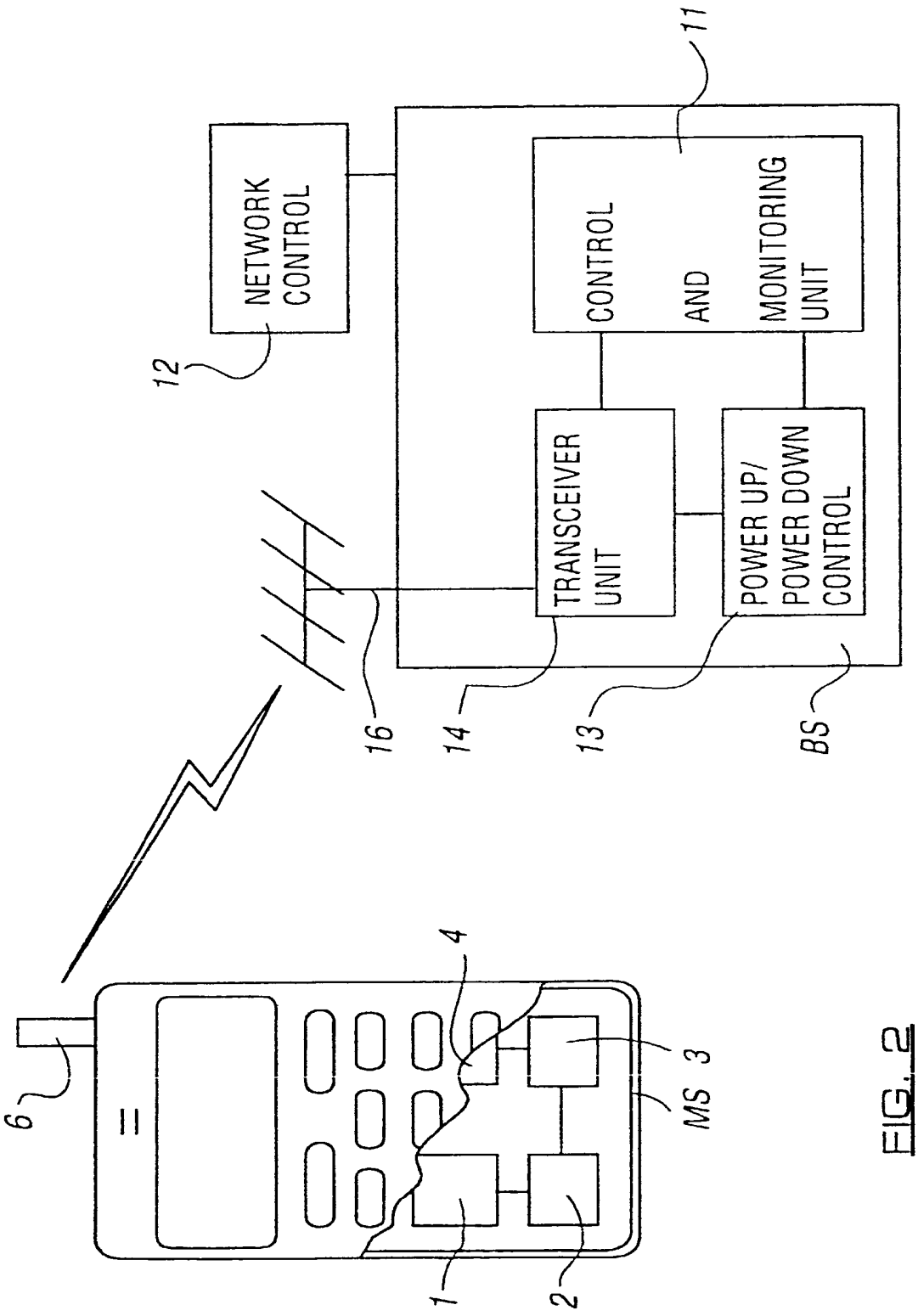
11
NETWORK CONTROL
12
CONTROL AND MONITORING UNIT
TRANSCEIVER UNIT
POWER UP/ POWER DOWN CONTROL
16
14
13
BS
4
6
MS 3
1
2

FIG. 2

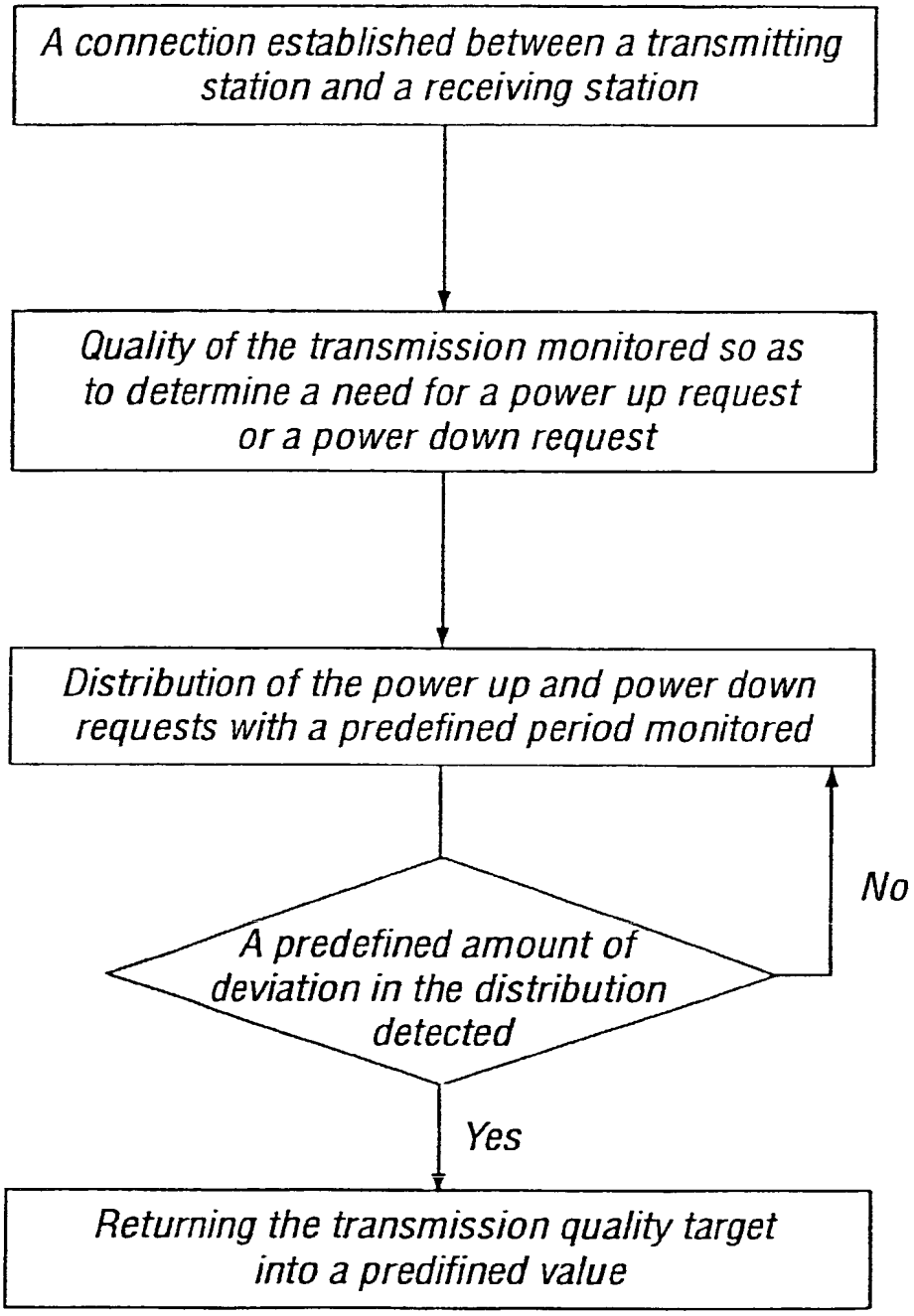
A connection established between a transmitting station and a receiving station
Quality of the transmission monitored so as to determine a need for a power up request or a power down request
Distribution of the power up and power down requests with a predefined period monitored
A predefined amount of deviation in the distribution detected
No
Yes
Returning the transmission quality target into a predifined value

FIG. 3

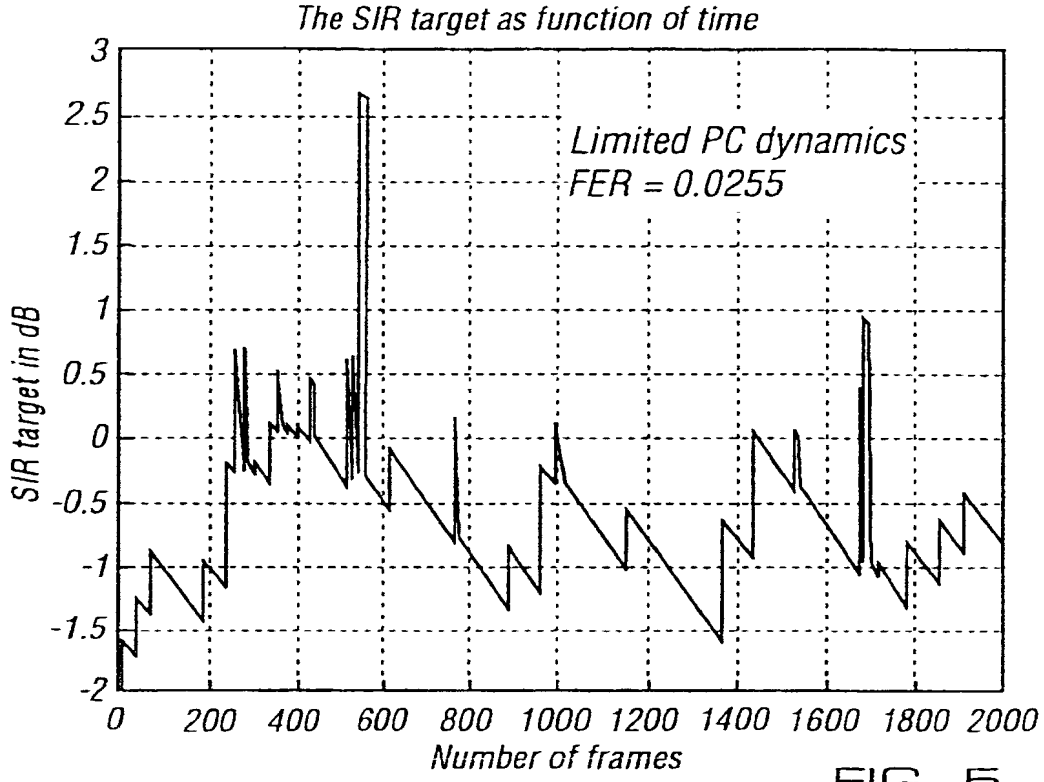
The SIR target as function of time
Limited PC dynamics
FER = 0.0255
SIR target in dB
Number of frames
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
200
400
600
800
1000
1200
1400
1600
1800
2000

FIG. 5

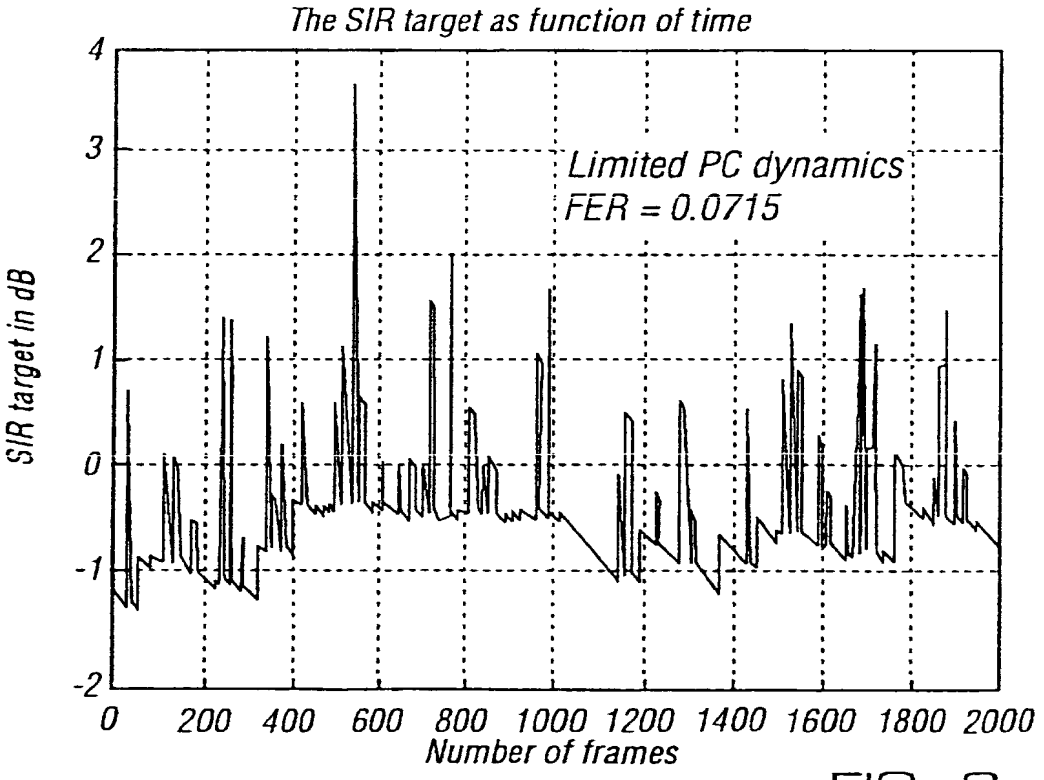
The SIR target as function of time
Limited PC dynamics
FER = 0.0715
SIR target in dB
Number of frames
4
3
2
1
0
-1
-2
0
200
400
600
800
1000
1200
1400
1600
1800
2000

FIG. 6

COMBINED DECLARATION AND POWER OF ATTORNEY

(Docket Number)
915-003.3

As a below named inventor, I hereby declare that:

- my residence, post office address and citizenship are as stated below next to my name;
- I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled Connection Control in a Communication System
- the specification of which is attached hereto unless the following box is checked [X]. If the box is checked,

the application was filed on February 8, 2002
as U S Application Number 10/049,249
or PCT International Application Number
and was amended on (if applicable). February 8, 2002

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U S C §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed

Prior Foreign Application			Priority Not Claimed
PCT/EP00/08145 (Application Number)	EP (Country)	17 August 2000 (Day/Month/Year Filed)	☐
9919595.0 (Application Number)	Great Britain (Country)	18 August 1999 (Day/Month/Year Filed)	☐

To the extent permitted by rule or law, I hereby incorporate by reference the Prior Foreign Application(s) listed above

I hereby claim the benefits under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

(Provisional Application Number)	(Day/Month/Year Filed)
(Provisional Application Number)	(Day/Month/Year Filed)

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U S C. §112, I acknowledge the duty to disclose information which is material to patentability, as defined in 37 CFR §1.56, which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application Number)	(Day/Month/Year Filed)	(Status--patented, pending, abandoned)
(Application Number)	(Day/Month/Year Filed)	(Status--patented, pending, abandoned)

The undersigned hereby authorizes the U S firm of **Ware, Fressola, Van Der Sluys & Adolphson LLP** to accept and follow instructions from the English firm of **Page White & Farrer** as to any action to be taken in the U S. Patent and Trademark Office regarding this application without direct communication between the U S firm and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U S firm will be so notified by the undersigned

I hereby appoint the attorney(s) and/or agent(s) assigned to the customer number listed below, as may from time to time be amended, belonging to the U S. firm of **Ware, Fressola, Van Der Sluys & Adolphson LLP**, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith

Customer Number

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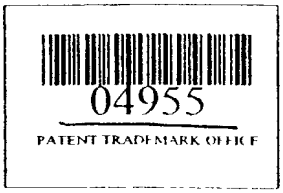

Address all telephone calls to: Ware, Fressola, Van Der Sluys & Adolphson LLP at (203) 261-1234. **Address all correspondence to:** Alfred A. Fressola

Customer Number

4955

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

100

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